Images in cardiology. Development of the human heart: days 15-21.

Jean-Marc Schleich

IMAGES IN EMBRYOLOGY

Development of the human heart: days 15–21

In this series, three dimensional computer graphics are used to present the anatomical structures involved in the different stages of normal human heart development. Below we present the development of the trilaminar germ disc and the formation of the primitive endocardial tube and the aortae during the third week of pregnancy. For further details and graphics please visit: www.virtual-heart-development.univ-rennes1.fr

During the third week of gestation (days 15–21), the following stages occur: development of the primitive streak—gastrulation (day 15); formation of intra-embryonic mesoderm (day 16); mesoblast differentiation—somatopleura and splanchnopleura (day 17); development of blood islets, the cardiogenic region, and primitive heart tubes (day 19); and formation of primitive endocardial tube (day 21).

During this time the bilaminar germ disc grows, especially in the cephalo-caudal axis. At the beginning of the third week, a midline structure called the **primitive streak** appears in the epiblast, near the caudal end of the disc. Epiblast cells detach along the primitive streak and migrate into the space between the epiblast and hypoblast layers. This penetrating phenomenon is called **gastrulation**. This migration forms a third layer called the **intra-embryonic mesoderm** (in red) (panel A) which goes to the cephalic end of the embryo. In this third layer, cellular groups, called **blood islands**, can be distinguished that form the shape of a horse shoe (panel B) . At the cranial end of the embryo, the blood islands form the **cardiogenic region**. Laterally, the angioblastic cords coalesce. On day 17, the lateral layer divides into two layers (panel C) : the ventral layer will produce a pair of **endocardial tubes** and the dorsal layer will produce the two **aortae** (panel D) . Embryonic folding brings the endocardial tubes into the ventral thorax where they fuse to form a single **primitive heart tube** (panel E). At this stage of development, the embryo is 2–3 mm long.

Panel F shows the primitive heart tube. Starting at the inflow tract, we see the **sinus venosus** receiving the venous blood of the embryo, followed by the **primitive atrium**, the **primitive ventricle**, the **bulbus cordis**, and finally the **truncus arteriosus** which divides into paired dorsal aortae forming the outflow tract of the primitive heart tube.

J-Marc Schleich
jean-marc.schleich@chu-rennes.fr